

possible, the greatest of record for January. Over the Pacific coast sections the precipitation was practically everywhere less than normal, the deficiencies being large in California, where similar conditions have persisted for several months.

SNOWFALL.

In nearly all sections of the country the snowfall for January was less than normal, although considerable areas had a slight covering during much of the month. In the districts east of the Rocky Mountains the greatest depths were reported from northern New York, the interior of New England, and over the upper Lake region, but no particularly heavy falls occurred during the month. In general, not much interference to business interests resulted from drifting snow, save in Iowa and portions of adjoining States, where traffic was interrupted following the storm of the 8th and 9th and again about the 15th.

In the western Mountain districts the snowfall during January was likewise less than normal, though in portions of the middle Rocky Mountains there were more generous amounts.

In California and the adjacent portions of Oregon and Nevada the snowfall was unusually light, and in some sections probably the lightest of record for January.

The stored amounts in the higher mountains at the end of the month, where great importance attaches to the probable supply of water for irrigation and power purposes, are nearly everywhere less than normal.

Over the northern districts from the Great Lakes westward ice of sufficient thickness to harvest formed early in the month, and its storage progressed satisfactorily, through the month. In the more eastern districts, however, where ice is gathered for commercial purposes, it did not acquire a satisfactory thickness until late in the month.

RELATIVE HUMIDITY.

Despite the absence of appreciable precipitation over the Great Plains and mountain districts of the West, the relative humidity in these regions was mainly above normal. Over the Pacific coast States, however, particularly in California, the drought conditions were reflected in the lowered percentage of the relative humidity, which was in some cases nearly 20 per cent less than normal. On the other hand over the Atlantic and Gulf coast States, despite the fact that precipitation was generous to heavy, the relative humidity was also less than normal.

SEVERE LOCAL STORMS, JANUARY, 1924.

[The table herewith contains such data as have been received concerning severe local storms that occurred during the month. A more complete statement will appear in the annual report of the Chief of Bureau.]

Place.	Date.	Time.	Width of path, yards.	Loss of life.	Value of property destroyed.	Character of storm.	Remarks.	Authority.
Brooklyn, N. Y.....	1	.....	.....	.....	.....	Wind.....	A number of houses in course of construction were wrecked.	Daily News (New York).
Meridian, Miss. (4 miles south-west of).	3	1-2 a. m.....	.....	.....	.....	Tornado.....	Four homes wrecked and a store damaged; 1 person injured.	Official, U. S. Weather Bureau.
Rome, Ga.....	10	P. m.....	.....	.....	.....	Wind.....	Considerable property damaged and 2 persons injured.	Star (Anniston, Ala.).
Central and northeastern Alabama.	10	...do.....	.....	2	.....	...do.....	Several dwellings damaged and a number of barns and sheds wrecked; some livestock killed; several persons injured.	Do. Pensacola News (Fla.).
New York, N. Y., and vicinity.	16-17	6	High winds.....	General damage done; many persons injured.	Official, U. S. Weather Bureau.

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STORMS AND WEATHER WARNINGS.

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WASHINGTON FORECAST DISTRICT.

The month of January was notable for the frequency and pronounced character of its temperature changes, and this was particularly true of the Middle West and the Northwest, where a number of pronounced cold waves, that came southward out of Canada, reduced the temperatures for the month greatly below the normal. While these cold waves in several instances advanced eastward to the Atlantic coast and southward to the Gulf of Mexico, they were greatly modified in severity, and consequently no record-breaking low temperatures occurred except over limited areas. The eastward passage of high and low pressure areas occurred with great frequency, and as a result there were marked changes from high to low temperature and frequent changes from fair to falling weather. Moreover, the issue of storm warnings for the coastal waters was rather more than is ordinarily required for the month of January. The notable storm of the month occurred on the 16th, when southerly gales broke the airship *Shenandoah* from its mooring mast at Lakehurst, N. J.; and it was only because of a lull in the wind shortly thereafter was her crew able to

bring her back to her hangar at Lakehurst. At noon of the day in question the Bureau of Aeronautics of the United States Navy Department was advised that the wind at Lakehurst would likely reach a velocity of 60 miles an hour or more during the late afternoon and early night.

The month opened with high barometric pressure general east of the Rocky Mountains, but with a low-pressure area of increasing intensity over the western Plateau region. This disturbance lost intensity in moving southeastward during the night of the 1st, but on the morning of the 2d there were unmistakable evidences of the formation of a center of low pressure over the northwestern portion of the Gulf of Mexico. This disturbance developed, as foreseen, and advanced northeastward and produced general precipitation over and east of the Mississippi Valley during the succeeding 36 hours. This was in turn followed by an area of high barometric pressure of great magnitude which on the morning of the 3d had its crest over the Northwestern States, and made necessary the issue of cold-wave warnings for practically all parts of the Washington Forecast District. These warnings were issued on the 3d, 4th, and 5th as the cold wave advanced eastward. On the 5th, as this high pressure was advancing eastward and the pressure falling rapidly off the Atlantic coast, storm

warnings were displayed on the Atlantic coast southward from New England to Jacksonville, Fla., and on the 6th when a disturbance of increasing intensity was central off Cape Cod, northwest storm warnings were continued at and north of Delaware Breakwater. The evening of the same day and for the same stretch of coast the warnings were changed to southwest, for strong backing winds attending the eastward movement of a disturbance of pronounced character that had its center north of the Great Lakes. This disturbance passed rapidly eastward to the Gulf of St. Lawrence with strong winds and gales along the coast where storm warnings were displayed; and it was followed by rapidly rising pressure and decidedly colder weather along the northeastern border, cold-wave warnings being ordered the morning of the 7th for northeastern New York and northern New England.

On the 10th when a disturbance of pronounced character was central over the Mississippi Valley and advancing eastward, small-craft warnings were displayed over the Mobile and Pensacola storm warning districts, northeast storm warnings on the New England coast and southwest storm warnings along the coast at and between New York City and Savannah, Ga. This disturbance advanced steadily east-northeastward, and storm winds were general during the night of the 10th and during the 11th along the Atlantic coast. The highest velocity reported was 72 miles an hour from the south at New York City and Atlantic City. Relatively tranquil weather prevailed from the 11th until the 15th and 16th, although storm warnings were displayed on the Atlantic coast from Delaware Breakwater to Boston on the 13th when a disturbance of moderate intensity was central off Cape Hatteras. It moved northeastward, its center, however, keeping off the coast, and no winds of gale force occurred over the area where storm signals were displayed. On the 15th, the pressure was abnormally high in the Atlantic States and low in the Mississippi Valley, with a center of minimum pressure over Louisiana. The system of low pressure was advancing northeastward and the Louisiana disturbance increasing in intensity. Therefore, in the early morning small-craft warnings were displayed on the east Gulf coast and later in the day southeast storm warnings were displayed on the Atlantic coast at and between Jacksonville, Fla., and the Virginia Capes. On the morning of the 16th when the center of the disturbance was over Indiana, southeast storm warnings were displayed on the Atlantic coast north of the Virginia Capes and cold-wave warnings were ordered for Tennessee, the Ohio Valley, and the lower Lake region. This disturbance is the one referred to in the opening paragraph as being the most intense of the month on the Atlantic coast. The highest wind velocity reported was 76 miles an hour at Atlantic City, N. J.

On the 19th and 20th the pressure rose abnormally over the northwest following the eastward movement of a belt of low pressure which extended southward from the northern border to the Gulf of Mexico, and as the change to colder therewith was pronounced, it was necessary on the 19th and 20th to issue cold-wave warnings for practically all parts of the Washington Forecast District and northwest storm warnings on the morning of the 20th for the Atlantic and Gulf coasts. It was also necessary on the 22d to issue southwest storm warnings for the Atlantic coast north of Delaware Breakwater and to continue these storm warnings on the 23d, on which date cold-wave warnings were also displayed over northeastern New York and northern New

England. On the 24th, when the barometric pressure was quite high in the Atlantic States, low over the lower Mississippi Valley and high and rising rapidly in the northwest, southeast storm warnings were displayed on the east Gulf and Atlantic coasts and cold-wave warnings were displayed in western Tennessee and Kentucky. On the 25th cold-wave warnings were displayed over practically the entire Washington Forecast District and storm warnings were continued on the Atlantic coast at and north of Cape Hatteras. The severity of this storm was such as to require that storm warnings be continued on the 26th at and north of Delaware Breakwater.

CHICAGO FORECAST DISTRICT.

In the Chicago forecast district, January, 1924, was a rather notable month. Over the Missouri and middle and upper Mississippi valleys, as well as in the extreme western upper Lake region, it was, generally speaking, the coldest January since the memorable month of that name in 1918. Sudden and marked alternations in temperature were a feature of the month, and over at least a limited area (Chicago and its vicinity) the mean daily variability of temperature exceeded all previous records of this character. As might be inferred from the foregoing, cold waves were of frequent occurrence, and in one or two instances these were of great severity in portions of the district.

Cold wave warnings.—In this section of the REVIEW for December, 1923, reference was made to the culmination, in the first week of the month now under discussion, of the cold wave that affected the district during the closing days of December, and which finally resulted in the lowest temperatures in a decade or more at many points. The conditions during the few days preceding January 5 (when the crest of the cold was reached) were as follows: On the 1st and 2d a pronounced katalobar, with an attendant marked rise in temperature from the prevailing zero values, moved rapidly east-northeastward from the southern Rocky Mountain Plateau to the lower Lake region. This was closely followed by an analobar of similar character, with the result that a decided fall in temperature occurred on the night of the 2-3d throughout the upper Mississippi and the middle and lower Missouri Valleys, the fall reaching the proportions of a cold wave over a large part of the area named. Cold-wave warnings were issued on the night of the 2d for northeastern Michigan, and these were verified. Twelve hours later the warnings were extended to include eastern Lower Michigan and eastern and southern Indiana. While a considerable fall in temperature occurred over these areas, a technical verification was not attained. In the meantime a high pressure area with attendant very low temperatures had been developing over British Columbia, and at the same time increasing in magnitude. By the morning of the 3d the barometer at Kamloops was 30.68 inches and the temperature -10° , while an area of falling barometer was over the middle Rocky Mountain Plateau. Twelve hours later this latter area was forced to western Texas, and by the morning of the 4th to extreme southern Texas, whence it moved rapidly northeastward, in deepened form, to the upper Ohio Valley on the night of the 4th. During the passage of this katalobar a portion of the British Columbia high area moved to the upper Missouri Valley, the barometer at the same time continuing to rise, so that readings were 31 inches or somewhat above over a considerable area on the 4th. By the early night of that date severe